Hab. Rhio Archipelago. (Type from Karimon.)

Type. Adult female. Original number 1366. Collected 13th August, 1908.

Seventeen specimens examined from the islands of Karimon, Kundur, Batam, and Bintang.

(9) *Mus rattus rhionis*, subsp. n.

A rat of the *albescens* type of the *rattus* group, but darker than any known Malayan form.

Hab. Bintang and Batam Islands, Rhio Archipelago. (Type from Bintang.)

Type. Adult male. Original number 739. Collected 8th June, 1908.

A series of eighteen specimens, of both sexes and all ages, from the two islands examined. The general appearance throughout is very uniform.

(10) *Sus andersoni*, sp. n.

A pig of the *S. vittatus* group allied to *S. rhionis*, but with conspicuously smaller teeth.

Upper length of skull 310 mm. p^2 10 × 4·3 mm.; p^3 11 × 8·3; p^4 10·3 × 12.

Hab. Islands of the Rhio Archipelago. (Type from Batam Island.)

Type. Adult female. Original number 927. Collected 15th July, 1908.

Four specimens examined.

LVIII.—*The Genus* Puerulus, *Ortmann, and the Post-larval Development of the Spiny Lobsters* (Palinuridæ). By W. T. Calman, D.Sc.

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The genus *Puer* was established by Ortmann * in 1891 for the reception of *Panulirus angulatus*, Spence Bate, and a new species from Japan described under the name of *P. pellucidus*. The genus was distinguished from *Senex* (= *Panulirus*) by having the antennular segment unarmed and the cephalothorax with a pair of lateral ridges, giving it a prismatic

* Zool. Jahrb. Syst. vi. pp. 15 & 37 (1891).

instead of cylindrical form. In 1894 the same author * added a third species, *P. spiniger*, from Amboina, and in 1897 he replaced the preoccupied name *Puer* by *Puerulus* †. In 1905 Bouvier, overlooking the change in the generic name, described a species, *Puer atlanticus*, from the Cape Verde Islands ‡ and Dahomey §. Judging from the very brief description of Bouvier's species, I suspect that it will prove to be identical with *Panulirus inermis*, described by Pocock ‖ from Fernando Noronha, of which the type is in the British Museum.

Among these species, the first-named, *P. angulatus*, stands apart. Although the type specimen described by Spence Bate ¶ was only 36 mm. in length of body and was obviously immature, Alcock ** has since described specimens measuring up to 169 mm. in length, and showing in the males the orifices of the genital ducts. In a female specimen, 164 mm. in length, for which I am indebted to Dr. N. Annandale, Superintendent of the Indian Museum, Calcutta, the orifices of the oviducts are distinctly visible. There can be no doubt that these specimens are adult or nearly so, and that *P. angulatus* is a perfectly distinct and independent species, which may be taken as the type of the genus *Puerulus*. Alcock, it is true, ignores the genus altogether, and retains the species in the genus *Panulirus*. It appears to me, however, that *Puerulus*, as represented by this species, may well stand as a valid genus, which is probably more closely allied to *Linuparus* than to *Panulirus*. It resembles *Linuparus* not only in the prismatic form of the carapace, but also in the disposition of the pleopods in the female sex ; in *Puerulus* and *Linuparus* the pleopods of the second abdominal somite of the female resemble those of the three following somites, having the endopodite narrow and the appendix interna large ; in *Panulirus*, as in *Palinurus* and *Jasus*, the pleopods of the second somite differ greatly from the succeeding pairs, having the endopodite broad and foliaceous like the exopodite, and the appendix interna reduced to a vestige ††.

* Semon's "Forschungsreisen," v. (Denkschr. Med. Nat. Ges. Jena, viii.) p. 19 (1894).

† Amer. Journ. Sci. (4) iv. p. 290, footnote (1897).

‡ Bull. Mus. Oceanogr. Monaco, xxviii. p. 2 (1905).

§ *Op. cit.* xxix. p. 6 (1905).

‖ Journ. Linn. Soc., Zool. xx. p. 516 (1890).

¶ 'Challenger' Macrura Rep. p. 81 (1888).

** Cat. Indian Deep-sea Macrura and Anomala, p. 185 (1901).

†† I may take this opportunity of correcting an error in my recently published volume on Crustacea in Sir Ray Lankester's 'Treatise on Zoology.' On p. 312 the Scyllaridea are defined (following most recent

The remaining three species referred to *Puerulus* (*P. pellucidus*, *P. spiniger*, and *P. atlanticus*) are all described from specimens of small size (not exceeding 22 mm. length), and this circumstance, together with the slight development of the spines on the carapace and the general thinness of the integument, suggests that they are immature forms. Ortmann has discussed this possibility in describing *P. spiniger* (*loc. cit.*), which was found together with small specimens of *Panulirus versicolor* (or, as Ortmann called it, *P. polyphagus*), and which resembles that species in having no exopodite on the third maxilliped. Ortmann notes, however, that the young specimens of *Panulirus* did not exceed in size those of *Puerulus*, although the former had assumed the specific characters of the adult in the spinulation of the carapace and in other respects; he infers that *Puerulus spiniger* cannot be the young form of *Panulirus versicolor*, and he further concludes that the differences between the two genera are so great that *Puerulus*, if not an adult, must be the young of some hitherto undiscovered form of Palinurid.

It appears to have escaped notice that these small species of *Puerulus* agree exactly with Boas's * description of what he calls the "Natant"-stage of the Palinuridæ. Boas found vestiges of exopodites persisting on the thoracic legs of some of his specimens, and he further notes that they retained larval characters in the relative shortness of the antennular peduncle, in having the third maxillipeds separated from each other at the base, and the maxillipeds and maxillæ soft, sparsely setose, and of embryonic appearance. The absence of the "cervical" groove (*c*), the presence of lateral ridges, and the small number of spines on the carapace are also mentioned, and an important larval character was found in the persistence of coupling-hooks on the appendix interna of the pleopods. The specimens measured up to 25 mm. in length. Boas also mentions that he had examined specimens of young Palinuridæ of about the same size as those in the Natant-stage, but agreeing with the adult except in the absence of sexual characters.

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authors) as lacking the first pair of pleopods. I overlooked the fact that these appendages are described as present in the female of *Palinurellus* by Boas (Kgl. Danske Vidensk. Selsk. Skr. (6) i. pp. 92 & 183 (1880), and Zool. Anz. v. p. 113, 1882) and by Spence Bate (Ann. & Mag. Nat. Hist. (5) vii. p. 220, 1881). I find that they are also present in a male specimen belonging to this genus in the British Museum collection.

* "Studier over Decapodernes Slaegtskabsforhold," Kgl. Danske Vidensk. Selsk. Skr. (6) i. p. 83 (1880).

Among the Palinuridæ collected by Dr. C. W. Andrews, F.R.S., on his recent visit to Christmas Island are five specimens presenting the characters of "*Puerulus spiniger*," Ortmann. They are all about 25 mm. in length of body, and were collected partly on the reef and partly in crevices in the piles of the pier at Flying-Fish Cove. In all of them the first four pairs of legs have, on the outer side of the basipodite, a soft shrivelled process, which is no doubt the vestige of an exopodite. The antennular peduncle is much shorter than the antennal; the third maxillipeds are widely separated at the base, and the other mouth-parts are soft, without setæ, and imperfectly formed; the appendix interna of the pleopods has an apical group of coupling-hooks. In all these characters the specimens agree with those described by Boas, and I see no reason to dissent from his conclusion that they represent a late stage, which may perhaps be called post-larval, in the development of a species of Palinurid.

I believe, however, that it is possible to go further, and to assign these specimens, with considerable confidence, to the species *Panulirus versicolor* (Latreille) *. As in the case of the specimens described by Ortmann from Amboina, those of the present collection were found together with young individuals of the species just named, some of which do not exceed the "*Puerulus*" form in size (25 mm.). The smaller specimens of the *Panulirus* differ from the larger (up to 74 mm. in length) in some small details of structure, *e. g.* in having the antennular peduncle shorter instead of longer than the antennal, in which they resemble the *Puerulus*-form. They also differ from the larger specimens in the less brilliant colouring, the bright purple being replaced, in the smaller spirit-specimens, by brown, and the longitudinal striping of the legs being undeveloped. The general pattern of the coloration remains, however, the same. Ortmann describes (*loc. cit.*) the "Jugendfärbung" of this species, mentioning especially a W-shaped marking on the carapace formed by a longitudinal white band on each side, and a pair of bands converging to the middle line from the hinder ends of these. He notes that in specimens of 26·5 and 33 mm. length this pattern was no longer visible. It would, perhaps, be more correct to say that the converging bands lose their importance as the colour-pattern increases in complexity, although they can still be recognized even in very large specimens. The

* As defined by Pfeffer, "Mitth. Mus. Hamburg" (Jahrb. Hamb. wiss. Anst.) xiv. pp. 255 & 262 (1897).

longitudinal lateral bands are always conspicuous. In the general pattern of their coloration the *Puerulus*-forms agree exactly with the youngest specimens of *Panulirus*. In three out of the five specimens collected by Dr. Andrews this pattern is very conspicuous, and in the other two, which are much paler, it can still be traced. In all, the ground-colour is a more or less rich brown and the lighter bands and spaces are yellowish or light buff. The lateral longitudinal bands (which do not coincide with the lateral ridges of the carapace) and the convergent bands completing the W are very well marked; the abdominal somites have each a light band posteriorly, with a fainter indication of the narrow marginal dark band seen in the young *Panulirus*. Further, if the carapace of one of the more darkly pigmented specimens of the *Puerulus*-form be examined under a lens, numerous darker spots can be seen, which correspond exactly in their arrangement with the spines on the carapace of a *Panulirus* of similar size. These spots no doubt represent the rudiments of the spines in course of development under the semi-transparent cuticle.

Boas states that the specimens of the Natant-stage examined by him represented several species belonging to both the longicorn and the brevicorn types of Palinuridæ. It does not seem possible at present to refer any of the other "*Puerulus*" species to definite species of adult Palinuridæ. Perhaps the "*Puer atlanticus*" of Bouvier (=*Panulirus inermis*, Pocock) may be the young of *Panulirus guttatus* (Latr.), in company with which it has been found (Pocock, Bouvier), and which it resembles in having a reduced exopodite on the third maxilliped.

In the British Museum collection are four specimens of a Palinurid in the Natant-stage from Stewart Island, New Zealand, which I suppose to belong to a species of *Jasus*. These have the general facies of the "*Puerulus*" forms described above, the integument being soft and semitransparent, the carapace somewhat depressed, with a longitudinal ridge on each side and with a small number of spines anteriorly. There is, however, a well-marked median rostral tooth, which is bent downwards, but does not reach the antennular segment as it does in the adult *Jasus*. Traces of exopodites are found on all but the last pair of legs.

The conclusions reached may be summed up as follows:—

(1) *Puerulus*, Ortmann, 1897 (=*Puer*, Ortmann, 1891), is a valid genus of Palinuridæ, of which the type species is *P. angulatus*, Spence Bate. It agrees with *Linuparus*,

White, and differs from the other genera of the family in the character of the pleopods in the female sex.

(2) The remaining species assigned to *Puerulus*, *P. pellucidus*, Ortm., *P. spiniger*, Ortm., and *P. atlanticus*, Bouvier (=*Panulirus inermis*, Pocock), are founded on specimens in a stage of development intermediate between the *Phyllosoma* and the adult form, called by Boas the "Natant-stage."

(3) *Puerulus spiniger*, Ortmann, is the Natant-stage of *Panulirus versicolor* (Latreille), and it passes into the adult form without any perceptible increase of size, while preserving unchanged the general pattern of coloration.

(4) *Jasus* passes through a Natant-stage differing from those which have been referred to *Puerulus* in possessing a median rostral tooth.

LIX.—*Preliminary Notice of the Cephalopoda collected by the Fishery Cruiser 'Goldseeker,'* 1903–1908.

By E. S. Russell, M.A., Research Student, University of Glasgow.

The collection of Cuttlefish made by the 'Goldseeker' under the International Committee for the Investigation of the North Sea (Scotland), and entrusted to me by Professor D'Arcy W. Thompson for description, contains representatives of sixteen species, of which three are new. The collections were made on the east and north coasts of Scotland, round the Shetlands, and between the Shetlands and the Faeroes.

Octopoda.

Polypus arcticus (*Prosch*).
—— piscatorum (*Verrill*).
—— faeroensis, sp. n.
Moschites cirrosa (*Lamarck*).

Decapoda.

Loligo forbesii, *Steenstrup*.
—— media (*L.*).
Rossia macrosoma (*Delle Chiaje*).
—— glaucopis, *Lovén*.
Sepiola rondeletii, *Leach*, var. scandica, *Stp.* (=S. oweniana, *Pfeffer*, 1908).
—— atlantica, *D'Orbigny*.
—— aurantiaca, *Jatta*.
Calliteuthis reversa, *Verrill*.
Brachioteuthis bowmani, sp. n.
Tracheloteuthis riisei, *Steenstrup* (including T. behnii, *Stp.*).
Desmoteuthis hyperborea (*Steenstrup*).
Taonidium pfefferi, sp. n.

Polypus faeroensis, sp. n.

The body is very plump and is much larger than the head. There is a distinct constriction between head and body. The breadth of the head is about three-quarters that of the body, its depth about three-fifths.

The colour is a fine reddish purple, of a deep shade on the